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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/039,940	10/26/2001	Bowie G. Keefer	6454-56839	8442

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EXAMINER
KALAFUT, STEPHEN J

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 09/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/039,940	KEEFER ET AL.
	Examiner	Art Unit
	Stephen J. Kalafut	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-89 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 14-22,24-30,35-63 and 69-79 is/are allowed.

6)☒ Claim(s) 1-4,6,7,12,13,23,31-33,64 and 68 is/are rejected.

7)☒ Claim(s) 5,8-11,34 and 65-97 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5,6 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 6, 7, 12, 13 and 31-33 are rejected under 35 U.S.C. 102(b) as being anticipated by Skowronski (US 5,811,201).

Skowronski discloses a fuel cell system including a fuel cell which operates between 1600 °F (871 °C) and 1800 °F (982 °C), such as a solid oxide fuel cell, although a molten carbonate fuel cell may also be used (column 3, lines 20-29), an air delivery system including a compressor (column 3, line 65 through column 4, line 1), and a gas turbine which is driven by fuel cell exhaust gas and in turn drives the compressor and a generator (column 4, lines 25-30). This generator would be an "auxiliary device" as recited in claim 12. Since the exhaust gas, produced by the exothermic fuel cell reaction, is used to drive the turbine, the turbine would constitute a means for recovering energy from the heat of the fuel cell. Claim 6 recites that the pump is a vacuum pump, but is open to the presence of the compressor instead of the pump, is thus still anticipated.

Claims 1-4, 6, 7, 12, 13 and 31-33 are rejected under 35 U.S.C. 102(a) and (e) as being anticipated by George *et al.* (US 6,255,010).

George *et al.* disclose a fuel cell system (10) including fuel cells (22) which operate between 600 °C and 1000 °C (column 3, lines 52-54), such as a solid oxide fuel cell (column 3, lines 20-23), an air delivery system including a compressor (28), and a gas turbine (26) which is driven by fuel cell exhaust gas (column 4, lines 1-4) and in turn drives the compressor and an alternator (46), which would be a type of "auxiliary device" as recited in claim 12. Since the exhaust gas, produced by the exothermic fuel cell reaction, is used to drive the turbine, the turbine would constitute a means for recovering energy from the heat of the fuel cell. Claim 6 recites that the pump is a vacuum pump, but is open to the presence of the compressor instead of the pump, is thus still anticipated.

Claims 1-4, 6, 7, 13 and 31-33 are rejected under 35 U.S.C. 102(e) as being anticipated by Rehg *et al.* (US 6,607,854).

Rehg *et al.* disclose a fuel cell system (10) including a fuel cell (17), such as a solid oxide fuel or a molten carbonate fuel cell (column 6, line 64 through column 7, line 8), an air delivery system including a compressor (12) and a gas turbine (19), which is driven by flue gas fed by a line (37) which is part of a hydrogen separation system which provides hydrogen to the fuel cell via another line (49). The turbine would thus be a means for recovering energy from the hydrogen gas separation system. Claim 6 recites that the pump is a vacuum pump, but is open to the presence of the compressor instead of the pump, is thus still anticipated.

Claims 64 and 68 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanabe *et al.* (Japanese 62-274,561).

Tanabe *et al.* disclose a system including a molten carbonate fuel cell (21) and a pressure swing adsorber (26), which separates the fuel cell exhaust (b), which contains residual H_2, into a stream which is enriched in H_2 (h) and a stream which is enriched in CO_2. The H_2-enriched stream is then recycled back into the fuel cell. The fuel cell exhaust would be a "heat recovery working fluid", which absorbs heat from the fuel cell, and is then introduced into the pressure swing adsorber.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakanishi *et al.* (US 4,595,642).

Nakanishi *et al.* disclose a fuel cell (21) connected to a pressure swing adsorber (27), which is in turn connected to a vacuum pump (28). The adsorber feeds highly pure oxygen to the fuel cell cathode (column 2, lines 8-10), and thus a stream of oxygen-depleted air to the vacuum pump. This would correspond to the present "heavy product gas stream". This claim differs by reciting the molten carbonate and solid oxide types of fuel cells. Nakanishi *et al.*, while describing a phosphoric acid fuel cell, also teach that other types of fuel cells, such as

alkaline, may be used (column 4, lines 43-47). Because the system of Nakanishi *et al.* is not limited to any specific type of fuel cell, and because the commonly known types of fuel cells use oxygen at their cathodes, it would be obvious to use any well-known type of fuel cell with the pressure swing adsorber and vacuum pump of Nakanishi *et al.*

Claims 14-22, 24-30, 35-63 and 69-79 are allowed. The prior art applied above or cited either below or by applicants, does not disclose a fuel cell system with a gas separation system for either hydrogen or oxygen, which produces an exhaust which powers a turbine; a molten carbonate fuel cell with a cathode inlet which receives a product gas from the combustion of a oxygen-containing gas and a CO_2-enriched gas; a method of operating a fuel cell and a pressure swing device which produces a fuel-enriched stream and a fuel-depleted stream, one of which is fed back into the device; a fuel cell system including a turbine coupled to both a fuel cell heat recovery system and a fuel gas delivery system; a fuel cell system including a including a turbine coupled to a fuel gas delivery system and a heat recovery working fluid in thermal contact with the fuel cell exhaust and in fluid contact with the turbine; a method of providing oxygen to a MCFC or a SOFC using a gas turbine, a pressure swing adsorber and a heat recovery working fluid; or a system which includes a MCFC or a SOFC, into which is fed H_2 from a pressure swing adsorber, the adsorber including, in addition to one adsorbent, either a second adsorbent, a reforming catalyst, or a water gas shift catalyst.

Claims 5, 8-11, 34, 65-67 and 80-89 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art also does not disclose a

pressure swing adsorber within the hydrogen separation system or oxygen delivery system within a fuel cell system including a compressor and means to drive the compressor with energy from these gas systems or the fuel cell heat; a method of fuel gas to a high temperature fuel cell including pressure swing adsorption on a fuel-containing gas which is air, or where a heat recovery fluid introduced into the pressure swing device is separate from the fuel cell exhaust, or also powers a turbine; or a fuel cell system including a hydrogen gas separation system which includes a pressure swing adsorber operating at temperatures above ambient, as well as a pump or compressor powered by energy recovered from fuel cell heat, an air deliver system or a hydrogen separation system.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ban *et al.* (US 6,428,915), Pettit (US 6,077,620), Wolfe *et al.* (US 5,968,680), Benz *et al.* (US 5,645,950) and Corgier *et al.* (EP 1,072,772) disclose fuel cell gas circulation systems including compressors and turbines. Ippommatsu *et al.* (US 5,147,735), Kaneko *et al.* (Japanese 63-166,157) and Mugerwa *et al.* (EP 345,908) disclose fuel cells with pressure swing adsorbers.

The disclosure is objected to because of the following informalities: Numeral 208 does not appear in figure 2, as stated on page 12, line 16. On page 14, line 25, "FIG 4" is mentioned, but there is no figured numbered "4" (without a letter). The specification, on page 17, lines 7, 17 and 18, and the drawings, in figures 1, 5A and 5B, use the numerals 125 and 126 to each denote two different items. The numeral 321 does not appear in figure 6, as stated on page 23, line 8.

The numeral 475 does not appear in figure 11, as stated on page 26, line 7. Appropriate correction is required.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen J. Kalafut whose telephone number is 703-308-0433. The examiner can normally be reached on Mon-Fri 8:00 am-4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 703-308-2383. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

sjk

STEPHEN KALAFUT
PRIMARY EXAMINER
GROUP 1700